First-Year Engineering Student Perceptions and Use of iPad Technologies: A Quantitative Investigation of Mobile Learning

UNDERGRADUATE RESEARCH THESIS

Presented in Fulfillment of the Requirements for
Honors Research Distinction in Engineering Education
College of Engineering, Engineering Education Department
The Ohio State University

By

Laine E. Rumreich
B.S. Computer Science & Engineering 2020

The Ohio State University
December 2019

Committee:

Dr. Krista M. Kecskemety
Assistant Professor of Practice
Dept. of Engineering Education
Honors Thesis Research Advisor

Dr. Richard Freuler
Professor of Practice
Dept. of Engineering Education
Honors Thesis Research Committee

1. ABSTRACT

Ohio State began a Digital Flagship initiative in autumn of 2018 with the goal to provide every incoming Ohio State student with an iPad, Apple Pencil, and Smart Keyboard. To assist in understanding how to best utilize the iPads in engineering education, the Engineering Education Department (EED) at Ohio State identified specific sections of the autumn 2018 First-year Engineering Program, referred to in this paper as First-year Engineering (FYE) courses as "iPad-designated" sections. Instructors teaching these sections were provided with an iPad and some training in an effort to support the use of the iPads in these specially designated sections.

While research exists on the use of iPads and other mobile devices in higher education, research specific to iPads as part of an engineering curriculum is limited. This study expands upon existing research by focusing specifically on FYE. This was accomplished through a survey project aimed at the FYE autumn 2018 students and instructors. The project goals were to identify attitudes about the iPad and its use in the FYE courses, and provide insight about how the iPad tools can improve the student experience with regard to learning new material, teamwork, and communication in FYE.

An understanding of student perceptions during the first year of implementation will allow the EED to identify opportunities to increase positive student learning outcomes. As these findings are incorporated in the planning and design of future FYE courses, it is expected that there will be greater use and acceptance of the iPads in the engineering curriculum.

The results of this study support the findings in literature that applications for note taking, drawing, and file sharing are well accepted and support student engagement with mobile devices. The need for more robust applications that are aligned with engineering student requirements was also uncovered. Some examples are MATLAB and SolidWorks. New insights are that students report a high level of use of the iPad for FYE purposes outside of the classroom, a moderate to high level in the classroom, and a low level of use for FYE laboratory activities. A comparison of the ratings on five value perception statements indicates that students who were part of the iPad designated courses perceive a higher level of value in the use of iPads versus those in non-iPad designated sections. These iPad section students also report more frequent use of the iPads both in the classrooms and in the FYE labs, a higher level of use of iPads for learning, reflection, and collaboration activities, and a stronger preference for using the iPad in other courses. They also rate their professor's comfort level with the iPad higher than do non-iPad section students. Among all FYE respondents, a positive relationship was found between the student's perception of the iPad improving the FYE experience and their likelihood to use the iPad in other courses. No correlation was observed between student perception of the iPad as part of the FYE experience and the student's final reported course grade. These insights support a continued focus by the EED on integration of the iPad in the FYE curriculum. A more thorough analysis of additional software and hardware needs is recommended. It is believed that emphasis on iPads in FYE, similar to the autumn 2018 iPad designated section focus, along with a resolution of some of the technology gaps identified in this study, will result in positive student perceptions and a high level of use of the devices as part of the FYE experience.

Keywords—iPads, mobile technology, student perceptions, first-year engineering

2. ACKNOWELDGEMENT

A sincere thank you to Dr. Krista M. Kecskemety, Faculty Advisor for Honors Research Distinction, for her excellent mentorship and support throughout this project, and for taking the time to guide me through the research distinction process.

Thank you to Dr. Rick Freuler, for agreeing to serve as a member of my Honors Research Distinction committee and for his exceptional teaching as my FEH 1281 and 1282 professor during my freshman year in engineering. I will always be grateful for his help in admitting me to the Ohio State engineering program in the summer of 2016.

TABLE OF CONTENTS

3. LIST OF FIGURES

4. LIST OF TABLES

5. INTRODUCTION

While many universities have started to supply mobile technology devices, defined by EDUCAUSE as iPads, laptops, tablet PCs, PDAs, and smart phones, to incoming students, little research has been done to investigate how these devices and applications are being used to facilitate learning in first-year engineering (FYE) programs [1-4]. In autumn 2018, The Ohio State University began supplying iPads to all incoming freshmen. In an effort to better understand perceptions about how mobile devices such as the iPad facilitate engineering education, a quantitative survey was implemented with FYE students, and a second survey was implemented with FYE instructors. These surveys explored how iPad technology can best support FYE activities in and out of the classroom. In preparation for the development of the surveys, a review of FYE activities in the university program resulted in classifying FYE course activities into three primary areas: learning, collaboration, and reflection. The goal of this research is to identify student and instructor attitudes about the iPad and its use in FYE courses, both formal and informal use, and provide insight about how its tools can improve the student experience with regard to learning new material, teamwork, and communication. This paper reviews relevant literature, followed by a description of the process for data collection, the analysis methods employed, the results obtained, and conclusions about what the results reveal regarding the value of the iPad in FYE. While this study addresses the use of iPads in FYE, its findings can provide insight into all mobile learning initiatives.

6. BACKGROUND

The introduction of mobile devices, and iPads specifically, has become common in both K-12 and higher education classrooms, and studies have found that they increase engagement among students [5–7]. To support student access to technology, a number of universities and colleges have begun to supply every first-year student with a personal iPad. The Ohio State University began supplying every first-year student with a personal iPad starting in autumn 2018 as part of the Digital Flagship initiative. While many studies exist on the implementation of the iPad in higher education, those centered on FYE and its unique learning challenges are limited. Diemer et al (2013) reported findings from several universities that support the ideas that iPad use promotes active learning, collaboration, and student engagement. They report their own research findings, conducted among multiple academic disciplines, that

> Mobile devices such as the iPad hold the potential to promote student engagement in the form of active and collaborative learning. Positive learning outcomes are likely to accompany use of iPads within university classrooms if the device effectively increases the level of student engagement. [8]

At the same time, research supports that FYE students prefer the use of technology in class as well as an instructor that is well versed in technology [9]. While there is evidence that engineering students tend to have positive opinions toward mobile learning and recognize the value of the device for file sharing and accessing course materials, challenges exist with understanding the types and frequency of mobile device use and its role in facilitating learning outcomes [10,11].

With the growth of technology and the value of team-based skills in the workplace, the need for developing collaboration skills continues to grow in importance across disciplines. The use of mobile devices has been found to be of value for collaborative learning in higher education, and for engineering specifically [4, 8, 12-14].

FYE has unique challenges due the wide range of activities taught. In addition to collaborative learning, basic engineering principles require design-based learning. These engineering principles involve the disciplines of physics and mathematics, and require visualization in three dimensional space [15]. Other learning activities in FYE include development of technical writing, problem solving, and critical thinking skills. Laboratory activities and a substantial amount of assigned homework are also significant to learning in FYE. The use of reflective activities is also a growing need in engineering education and can include requirements such as essays, discussions, and surveys [16].

While some studies provide evidence that mobile devices can enhance learning and result in improved attitudes in FYE [9], there are limited studies on how mobile technology can be used to facilitate the different types of activities. Some research has shown that specific applications, such as those for note taking, drawing, and file sharing, have been found to support engineering student engagement with the use of mobile devices [17, 18]. What is clear from the literature is that the iPad is starting to be used in engineering education for a variety of activities and that a range of applications are being evaluated to assist in enhancing the learning experience. What is not as well known, however, is how often students use the iPad and for what purposes, such as the various learning, collaboration, and reflection activities, and when the iPad is being used within and outside of the classroom for FYE.

For the purposes of this research, the iPad tools and applications for learning were defined as e-textbooks and applications for the university's course management system, notes, and drawing, including three-dimensional visualization. Collaboration was defined as applications that facilitate communication and collaboration through brainstorming, flowcharting, and work-sharing activities, including AirDrop, the online university-supported file sharing system BuckeyeBox, and Google Drive. Reflection tools were defined as those that support whiteboard and reflection assignments.

Understanding student perception is an important factor in the success of any new technology initiative, and student perceptions directly affect "how much effort students will expend on educationally purposeful activities, which consequently have direct effects on their learning" [19]. Bansavich, in his presentation at the 2011 EDUCAUSE conference, studied instructor implications of the iPad and recommended the study of student perceptions of the iPad for teaching and learning [20].

Understanding students' perception of the iPad and its use for activities related to learning, reflection, and collaboration, therefore, is significant in that positive perceptions lead to greater use, motivation, and engagement. These data provide an essential building block that will allow engineering educators to continue to develop strategies to incorporate these findings into the planning and design of future FYE and other engineering courses.

7. METHODOLOGY AND DEMOGRAPHICS

The survey development process began with an analysis of student responses to an open-ended question from an autumn 2018 end-of-course survey. These data were used to identify common uses of the iPad for FYE. Another resource for the development of the surveys was a review of survey questions about mobile learning uncovered during the literature review. One example was reported in a 2012 study by Jonathan Rossing, et al, where an interdisciplinary team of faculty from Indiana University-Purdue University Indianapolis implemented a survey about mobile learning. This general survey, not specific to engineering, was designed with both Likert-scale and open-ended response questions. They used a review process to verify that the survey questions were clearly stated, logically sequenced, and unambiguous

[14]. Several of these questions were adapted for this research project. A custom student survey and a custom instructor survey were then developed, and approval from the Institutional Review Board (IRB) was obtained. Both surveys were designed using Qualtrics online survey development software. Each survey was tested with small sample of respondents prior to implementation.

7.1 Student Methods

The FYE program courses included 1,875 pre-engineering students in the FYE course in autumn 2018. All of these students were sent an email invitation in early March of the spring 2019 semester inviting them to participate in the survey hosted on the Qualtrics site. An incentive was offered in an attempt to increase completion rates. Upon completion of the student survey, respondents were given the option to click a hyperlink to a separate survey where they could enter their email address for a chance to win one of four $25 Amazon gift cards. This contact information was not connected to the survey response submission so that respondent anonymity was maintained. In total, 391 usable responses were obtained, resulting in a 20.85% response rate for this analysis.

7.2 Student Instrument

The quantitative survey instrument for the student survey consisted of nineteen scaled response questions and one open-ended question. One section of questions asked students to provide information on how often they used the iPad in class, for FYE laboratories, and out of class, as well as what applications they had used. Another section asked them to rate their use of the iPad specifically for learning, reflection, and collaboration activities in and out of class. As a measure of students' perceptions of engagement, students were asked to rate their agreement with five statements using a 5-point Likert-type scale. The scale was automatically coded in Qualtrics for analysis purposes (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, strongly disagree = 1). The 2012 study by Diemer, et al. on iPad student engagement was used to assist in developing this set of five questions [8].

Finally, students were asked to answer additional questions that included likelihood to use the iPad for other courses, classifications for gender, course characteristics, final course grade, a rating question about their professor's comfort level with the iPad, and a free response question for additional comments.

7.3 Student Demographic Profile

Responses were approximately evenly split between students in iPad sections and non-iPad sections, with a response breakdown of 46% iPad section, 50% non-iPad section, and 4% who did not know.

There were 229 male (64.7%) and 123 female (34.7%) respondents, with two respondents identifying as Other. These statistics can be compared to the FYE population. According to the 2018 College of Engineering Annual Statistical Report, the Engineering - New First-Year Student Enrollment by Gender statistic for 2018 is reported to be 72% male and 28% female [21]. Respondents were asked to indicate their final course grade. The majority of responses indicated an A/A- grade (282 responses, 79%), with 65 (18.2%) indicating a B+,B, or B-, three (0.8%) a C+,C,C-, one a D or lower, and six who preferred not to answer.

The majority of the respondents (79.8%) indicate that they have used their iPad in other courses since FYE. 9.8% indicate they use it only when required, 4.2% indicate they have not used it since FYE, and the remainder (6.2%) indicate some other response.

7.4 iPad Section Designations in FYE

There were 34 FYE course sections in autumn 2018. Of these, eight were "iPad-designated" sections. Four of these iPad sections were 36-student honors (FEH) sections and four were 72-student standard (FE) sections. In the iPad sections, owning an iPad with specific university-provided applications was necessary. These sections were taught by a faculty member who also had a university-issued iPad and had been provided with some training. The use of an iPad was not required in the non-iPad sections of FYE, yet 90% or more of students in these classes were supplied an iPad by the university.

7.5 Instructor Methods

The autumn 2018 FYE program courses included 226 faculty, undergraduate teaching assistants, and graduate teaching associates, referred to as "instructors" for this research. All FYE course instructors were sent an email invitation during the spring 2019 semester inviting them to participate in the study survey hosted on the Qualtrics site. While 52 responses were received, 10 of these answered only the first two questions (*Did you use an iPad for the FYE course?* and *Why have you not used an iPad?*) and then abandoned the survey. In total, 42 usable responses were obtained, resulting in a 18.6% response rate for this analysis. It should be noted that for many questions, fewer than 42 responses were obtained.

7.6 Instructor Instrument

The quantitative survey instrument for the instructor survey consisted of eleven scaled response questions and one open-ended question. The first section focused on if and how the iPad was used, including frequency of use and perceived expertise level. The next section asked about how the instructor directed students to use the iPad. Finally, a matrix-structured question centered on rating the effectiveness of the iPad as a teaching tool for FYE for various tasks. Three of the questions collected demographic information.

7.7 Instructor Demographic Profile

The majority, 28 out of 42 respondents, are Undergraduate Teaching Assistants (UTAs). Nine respondents are Non Tenure-Track faculty and five are Graduate Teaching Associates. Twenty-eight (66.6%) instruct the FE sections, nine (21.4%) instruct FEH sections, three report teaching both FE and FEH and two responded "neither of these." Most have instructed in both AU18 and SP19 semesters.

Only six respondents indicate they use or have used an iPad as part of their preparation for FYE. For this reason, only these six respondents answered several of the survey questions, resulting in a very small sample size. It should be noted that UTAs and GTAs were not provided university-owned iPads. Questions on perception of effectiveness of the iPad were provided to all 42 respondents, even if they had not used an iPad themselves as part of FYE.

7.8 Analysis Methods

Survey responses from both the student and instructor survey instruments were analyzed in Qualtrics and also downloaded from Qualtrics into an Excel spreadsheet for further analysis. Descriptive statistics were calculated for all questions in Excel. Additional analysis by sub-group was also performed on the student results and significant findings are included in the Results section.

Excel was used to determine statistical significance using the two-sample t-test for means for Likert-scaled response questions. To determine significance between two sub-categories using non-Likert

response data, such as male and female, an online z-score test for two population proportions was used. This calculator has been verified with SPSS and Minitab, and can be found at socscistatistics.com.

To test the relationship between the iPad improving the FYE experience and the likelihood to use the iPad in other courses, a Pearson correlation coefficient was calculated in Excel. The relationship between the iPad improving the FYE experience and the course grade was also tested with a correlation analysis. For instructor results, the small sample size ($n = 6$ for some questions; $n \leq 42$ for some questions) precluded additional analysis beyond descriptive statistics.

8. RESULTS

8.1 Student Results

Descriptive statistics were performed by survey question. Frequencies were calculated to show the result distribution. Cumulative frequency is shown to easily determine the proportion of observations that lie above (or below) any particular value for frequency of use.

The t-test, two-sample test for means was used where a comparison of mean values was desired. The z-test for population proportions was used determine if a difference was observed between two groups on a characteristic. These tests were used to identify potential differences based upon demographic information included as part of the survey. The analysis included a review of results by gender, FE and FEH section, and iPad and non-iPad designated course sections.

8.1.1 Frequency of iPad Use

Students were asked how often they used their iPad in their FYE class, in their FYE labs, and outside of class for FYE work. Results are shown in Tables I-III. When looking at the sum of the top three categories, over half, 56.7%, of students report iPad use in the FYE classroom, 36.7% report iPad use during labs, and 78.8% report iPad use for FYE outside of the class or lab.

TABLE I. STUDENT USE OF IPAD IN FYE CLASS

Response	***Absolute Frequency***	***Relative Frequency***	***Cumulative Frequency***
Most of the time	83	21.2	21.2
About half the time	51	13.0	34.2
Sometimes	88	22.5	56.7
Rarely	123	31.5	88.2
Never	46	11.8	100
Total	391		

TABLE II. STUDENT USE OF IPAD DURING LABS FOR FYE

Response	***Absolute Frequency***	***Relative Frequency***	***Cumulative Frequency***
Most of the time	33	8.7	8.7
About half the time	29	7.7	16.4
Sometimes	77	20.3	36.7
Rarely	146	38.5	75.2
Never	94	24.8	100.0
Total	379		

TABLE III. STUDENT USE OF IPAD OUTSIDE OF CLASS OR LAB FOR FYE

Response	*Absolute Frequency*	*Relative Frequency*	*Cumulative Frequency*
Most of the time	115	30.1	30.1
About half the time	82	21.5	51.6
Sometimes	104	27.2	78.8
Rarely	58	15.2	94.0
Never	23	6.0	100
Total	382		

8.1.2 Type of Applications Used

Students were asked to indicate for what purposes they had used their iPad during the semester at least one time using a checklist of 17 applications or uses. The counts are shown in Fig. 1.

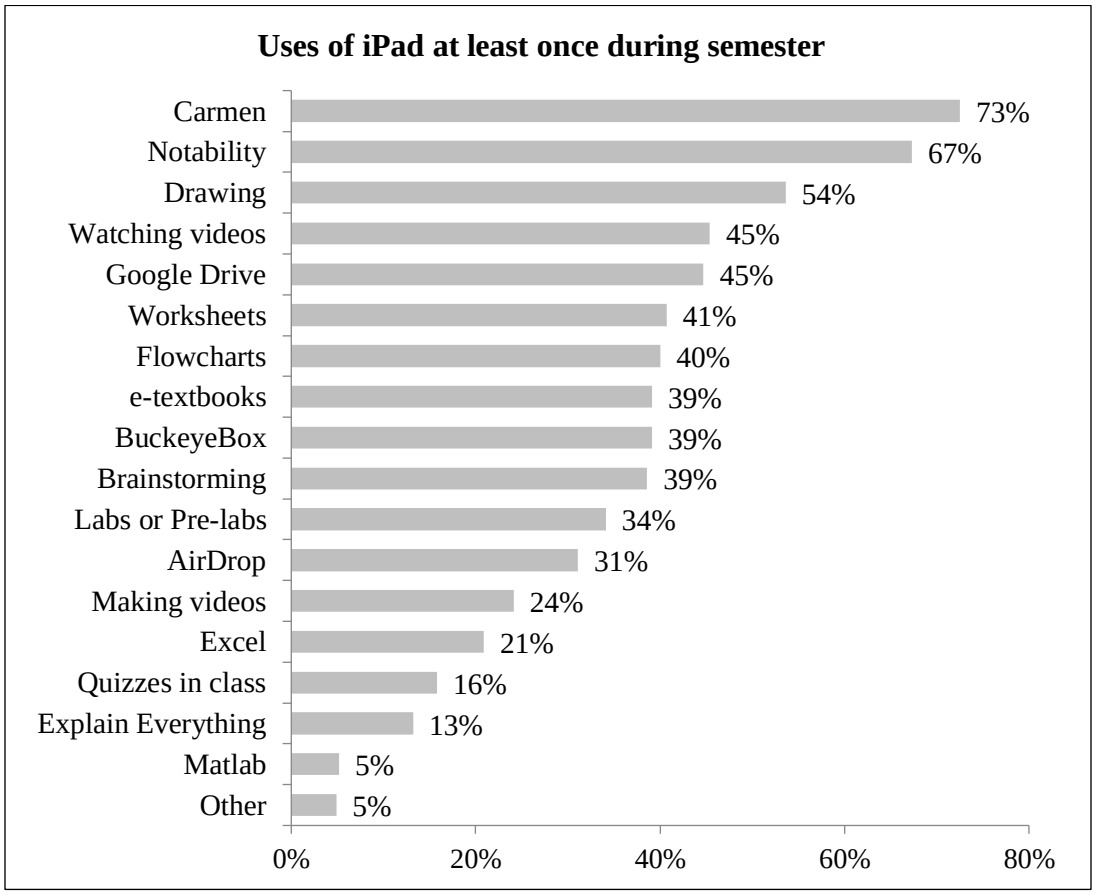

FIGURE 1. USES OF IPAD DURING THE SEMESTER

8.1.3 Use for Learning, Collaboration, and Reflection

Students were asked how often they used their iPad for activities related to learning, collaboration, and reflection in FYE. To assist the respondent, each of the three categories was defined for the student as part of the question (shown below).

Learning: e-textbooks, Carmen, notes, drawing
Reflection: whiteboard, reflection exercises
Collaboration: brainstorming, work sharing, AirDrop, BuckeyeBox, Google Drive

Nearly all indicate that they use the iPad for learning activities (91% a few times during the semester or more), and well over half use it once a week or more (57.7%). The iPad is also used by most students for collaboration activities (82.2% use it a few times during the semester or more), and 41.5% once a week or more. The iPad is used the least frequently for reflection activities (73.2% a few times during the semester or more), and a third (33.5%) use it once a week or more. Tables IV-VI provide further details.

TABLE IV. LEARNING ACTIVITIES

Response	***Absolute Frequency***	***Relative Frequency***	***Cumulative Frequency***
Nearly every day	122	32.4	32.4
Once or twice per week	95	25.3	57.7
Every couple of weeks	42	11.2	68.9
A few times during the semester	83	22.1	91.0
Never	34	9.0	100
Total	376		

TABLE V. COLLABORATION ACTIVITIES

Response	***Absolute Frequency***	***Relative Frequency***	***Cumulative Frequency***
Nearly every day	48	12.8	12.8
Once or twice per week	108	28.7	41.5
Every couple of weeks	66	17.6	59.1
A few times during the semester	87	23.1	82.2
Never	67	17.8	100
Total	376		

TABLE VI. REFLECTION ACTIVITIES

Response	***Absolute Frequency***	***Relative Frequency***	***Cumulative Frequency***
Nearly every day	34	9.0	9.0
Once or twice per week	92	24.5	33.5
Every couple of weeks	57	15.2	48.7
A few times during the semester	92	24.5	73.2
Never	101	26.8	100
Total	376		

8.1.4 Perceived Value and Future Use of iPad

There were 365 responses to the five rating questions about the perceived value of the iPad in FYE. These five questions used a 5-point Likert scaled response (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, strongly disagree = 1). Students reported neutral to slight agreement with each statement. As shown in Table VII, the use of the iPad improving the FYE experience has the highest mean (3.45), but also the highest standard deviation (1.14).

TABLE VII. DESCRIPTIVE STATISTICS FOR PERCEIVED VALUE OF THE IPAD IN FYE

Variable	***Min***	***Max***	***Mean***	***Std. Error***	***Std. Dev***
Activities using the iPad motivated me to learn the course material more than activities that did not use the iPad.	1.00	5.00	2.96	1.19	1.09
I participated more in class when we used the iPad than when we did not use the iPad.	1.00	5.00	2.97	1.19	1.09
My attention to the task(s) was greater using the iPad.	1.00	5.00	3.04	1.08	1.04
It is easier to work in a group using the iPad than in other group activities.	1.00	5.00	3.36	1.11	1.05
The ability to use the iPad for activities improved my experience in FYE	1.00	5.00	3.45	1.30	1.14

The survey asked students to indicate their final grade in the FYE course (see Section 7.3, Student Demographic Profile). There was no correlation found between the student's perception of the iPad improving the FYE experience and the course grade.

Students were asked to rate their likelihood to use the iPad for e-learning in other courses following their FYE iPad experience (n = 365). On a five-point Likert-type scale (very likely = 5, somewhat likely = 4, unsure = 3, somewhat unlikely = 2, very unlikely = 1), the mean value for this question is 4.25, with a standard deviation of 1.09 (n = 362). The majority of students (80.9%) are somewhat likely or likely to use the iPad for e-learning in other courses (see Fig. 2).

A Pearson correlation found a positive relationship between student's perception of the iPad improving the FYE experience and likelihood to use the iPad in other courses ($r = .67$, $p < .00001$).

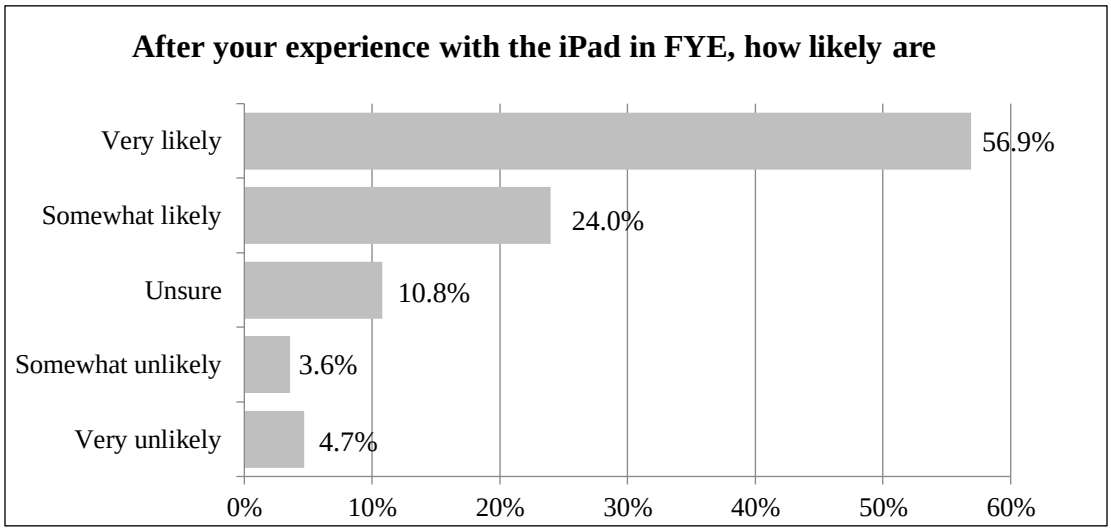

FIGURE 2. LIKELIHOOD TO USE IPAD IN OTHER COURSES

Preferences for iPad use in face-to-face to courses were indicated by the respondents (n = 363). Response options provided were: Extensive use, Moderate use, Little/no use, and No preference. More than three quarters of respondents indicate moderate or extensive use (75.8%), with moderate use being the most preferred at 60.1%. Only 11.8% desire little or no iPad use (see Fig. 3).

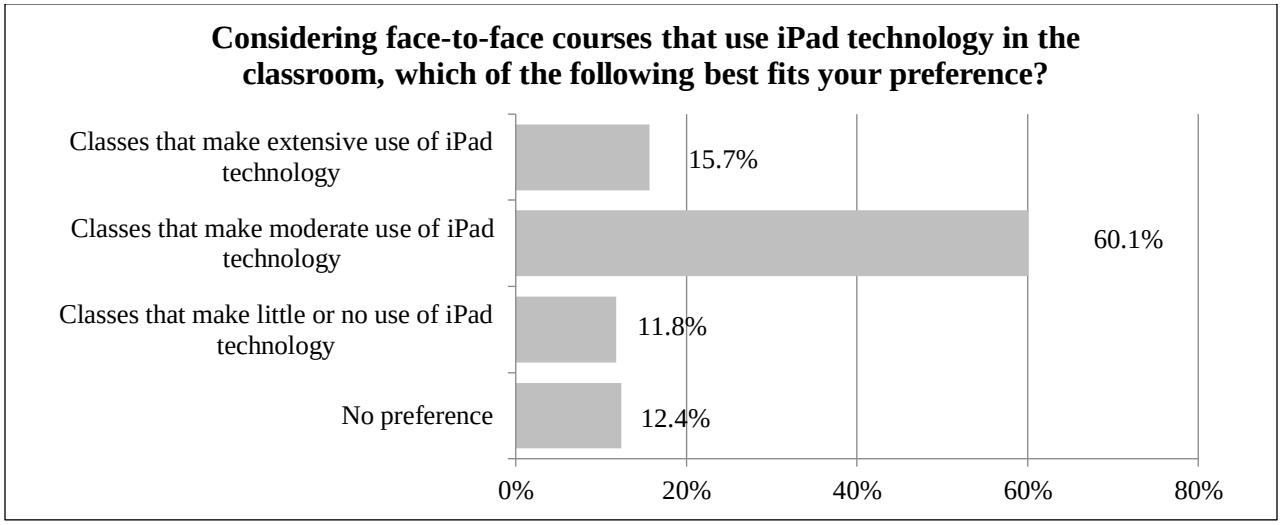

FIGURE 3. PREFERENCE FOR IPAD USE IN OTHER COURSES

8.1.5 Student Perception of Professor's comfort level with iPad

Students were asked to rate their Professor's comfort level with using the iPad as part of the course using a five-point verbal scale (very comfortable = 5, fairly comfortable = 4, unsure = 3, not very comfortable = 2, not at all comfortable = 1). The mean value for the results of this question is 3.41, with a standard deviation of 1.07 (n = 363). About one-third of the respondents were unsure, while just under a third indicate their professor was fairly comfortable. Only 18.5% indicate their professor was not very or not at all comfortable using the iPad (see Fig. 4).

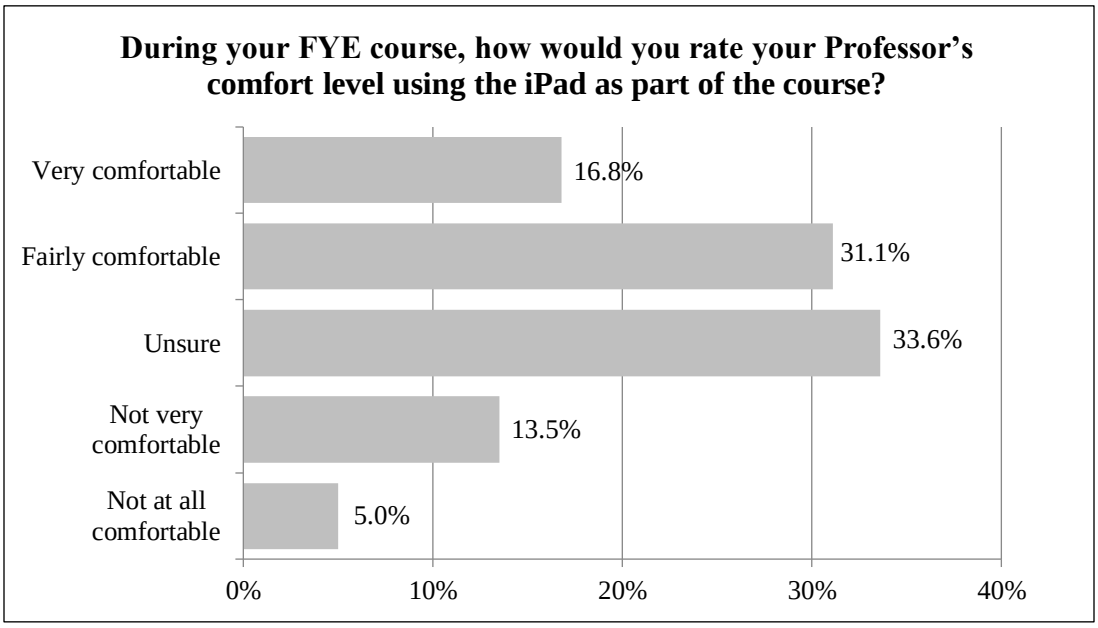

FIGURE 4. PROFESSOR'S COMFORT LEVEL WITH IPAD

8.1.6 Sub-Category Analysis: FE and FEH Sections

A cross tabulation analysis of the FE and FEH sections was performed. For this analysis, the responses to Question 16, *Which FYE course did you complete?* were used to define the categories. Responses of "FE iPad" and "FE non-iPad" were combined for the FE category and consist of 227 responses. Responses of "FEH iPad" and "FEH non-iPad" were combined for the FEH category and consist of 58 responses.

A significant difference between the FE and FEH sections was identified for the question, *How often would you say you used your iPad DURING LABS for your FYE course?*. There is a statistically significant difference when comparing the sum of responses for the categories "most of the time, about half of the time, and sometimes." Half (50%) of FEH students use the iPad during labs most of the time, about half of the time, or sometimes, while only 34% of FE respondents indicate this frequency of use. A z-score for population proportions was used to identify significance at $p \leq .05$ ($p = .0139$). FEH students use the iPad for labs more frequently than do FE students.

While a significant difference is observed, it should also be noted that the contact time in class and in labs differs between FE and FEH sections. FE classes meet for 110 min a week in class and 80 min in lab, while FEH meets 375 min for class and 125 min for lab. Other differences are course credit hours, with FE at two and FEH at five, and the number of labs, with FE at seven to eight and FEH at 12.

8.1.7 Sub-Category Analysis: Gender

A cross tabulation analysis using respondent identified gender was performed. There were 123 female responses and 229 male responses. Significant differences were identified for three questions.

A difference in responses by gender was found for the question, *How often did you use your iPad for collaboration activities in FYE?*. Collaboration activities were defined as brainstorming, worksharing, AirDrop, Buckeye Box, and Google Drive. There is a statistically significant difference when comparing the sum of responses of "Nearly every day" and "Once or twice per week" using a z-score for population proportions at $p \leq .05$ ($p = .01463$). Females are more likely to use the iPad for collaboration activities once or twice per week or more than are males.

TABLE VIII. USE OF IPAD FOR COLLABORATION ACTIVITIES NEARLY EVERY DAY AND ONCE OR TWICE PER WEEK COMBINED: BY GENDER

	Females	Males
How often did you use your iPad for Collaboration activities in FYE (Nearly every day and Once or twice per week)	50%	38%

A difference in responses by gender was found for the question, *After your experience with the iPad in FYE, how likely are you to use it for e-learning in other courses?*. Calculation of mean values after assigning values of 5 = very likely, 4 = somewhat likely, 3 = unsure, 2 = somewhat unlikely, 1 = very unlikely results in the finding that females are more likely to use the iPad in other courses than are males. A significant difference was found using a t-test of means ($p = 0.000782$).

TABLE IX. LIKELIHOOD TO USE THE IPAD FOR E-LEARNING IN OTHER COURSES: BY GENDER

	MEAN VALUE	
	Females	Males
After your experience with the iPad in FYE, how likely are you to use it for e-learning in other courses?	4.51	4.13

A difference in responses by gender was found for the question, *Considering face-to-face courses that use iPad technology in the classroom, which of the following best fits your preference?*. There is a statistically significant difference when comparing the proportion of responses of "Class that make Extensive Use of iPad technology" using a z-score for population proportions at $p \leq .05$ ($p = .02442$). The combination of "Moderate use" and "Extensive Use" was also tested and was found to be statistically different (females (84%) have a stronger preference than males (71%)) ($p = .00326$).

TABLE X. PREFERENCE FOR EXTENSIVE IPAD USE IN THE CLASSROOM: BY GENDER

	Females	Males
Preference for classes that make extensive use of iPad technology	21%	13%

8.1.8 Sub-Category Analysis: iPad and non-iPad Sections

For this analysis, the responses to Question 16, *Which FYE course did you complete?* were used to define the categories. Responses of "FE iPad" and "FEH iPad" were combined for the iPad category and consist of 162 responses. Responses of "FE non-iPad" and "FEH non-iPad" were combined for the non-iPad category and consist of 173 responses.

A cross tabulation analysis of the iPad designated and the non-iPad designated sections was performed on ten survey questions. Significant differences were found for nine of the ten questions. There was no difference for the question, *How often would you say you used your iPad OUTSIDE of class or labs for your FYE course?*.

The question, *How often would you say you used your iPad DURING CLASS for your FYE course*, was identified as showing a statistically significant difference when comparing the sum of responses for the categories "most of the time, about half of the time, and sometimes." A z-score for population proportions was used to identify significance at $p < .05$ ($p = .00004$).

TABLE XI. USE OF IPAD DURING CLASS FOR FYE: BY IPAD-SECTION DESIGNATION

	iPad	Non-iPad
Frequency of iPad use during class (most of the time, about half of the time, and sometimes)	69%	48%

The question, *How often would you say you used your iPad DURING LABS for your FYE course?* was identified as showing a statistically significant difference when comparing the sum of responses for the categories "most of the time, about half of the time, and sometimes." A z-score for population proportions was used to identify significance at $p < .05$ ($p = .0005$).

TABLE XII. USE OF IPAD DURING LABS FOR FYE: BY IPAD-SECTION DESIGNATION

	iPad	Non iPad
Frequency of iPad use during labs (most of the time, about half of the time, and sometimes)	47%	29%

Respondents were asked about frequency of iPad use for learning, reflection, and collaboration. When comparing the iPad course sections and the non-iPad course sections for the proportion of responses for use at least once per week or more (a combination of responses of "nearly every day" and "once or twice per week"), all three questions showed a significant difference between groups.

TABLE XIII. USE OF IPAD FOR LEARNING ACTIVITIES: BY IPAD-SECTION DESIGNATION

	iPad	Non-iPad
Use of iPad for Learning Activities (nearly every day and once or twice per week responses)	65%	49%

A z-score for population proportions was used to identify significance at $p < .05$ ($p = .00025$).

TABLE XIV. USE OF IPAD FOR REFLECTION ACTIVITIES: BY IPAD-SECTION DESIGNATION

	iPad	Non-iPad
Use of iPad for Reflection Activities (nearly every day and once or twice per week responses)	48%	21%

A z-score for population proportions was used to identify significance at $p < .05$ ($p = .00001$).

TABLE XV. USE OF IPAD FOR COLLABORATION ACTIVITIES: BY IPAD-SECTION DESIGNATION

	iPad	Non-iPad
Use of iPad for Collaboration Activities (nearly every day and once or twice per week responses)	51%	35%

A z-score for population proportions was used to identify significance at $p < .05$ ($p = .00226$).

Five questions were asked relating to the perceived value of the iPad in FYE. Respondents used a 5-point verbal rating scale (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, strongly disagree = 1). Each of the five questions shows a significant difference between the iPad section students and the non-iPad section students using a t-test of means. As shown in Table XVII, the iPad sections responses are all above a 3.0 mean value, while only two questions are above 3.0 for the non-iPad sections.

TABLE XVI. MEAN RESULTS FOR PERCEIVED VALUE OF THE IPAD IN FYE: BY IPAD-SECTION DESIGNATION

	MEANS	
Value Statement	iPad	Non-iPad
Activities using the iPad motivated me to learn the course material more than activities that did not use the iPad. (a)	3.19	2.82
I participated more in class when we used the iPad than when we did not use the iPad. (b)	3.20	2.79
My attention to the task(s) was greater using the iPad. (c)	3.24	2.91
It is easier to work in a group using the iPad than in other group activities. (d)	3.57	3.27
The ability to use the iPad for activities improved my experience in FYE. (e)	3.74	3.28

$p < .05$ (a) $p = 0.0008$; (b) $p = 0.000206$; (c) $p = 0.002092$; (d) $p = 0.001374$; (e) $p = 9.2E-05$

Respondents were asked to provide ratings for the question, *After your experience with the iPad in FYE, how likely are you to use it for e-learning in other courses?* (5 = very likely, 4 = somewhat likely, 3 = unsure, 2 = somewhat unlikely, 1 = very unlikely). A significant difference was found using a t-test of means (p = 0.001804).

TABLE XVII. LIKELIHOOD TO USE THE IPAD FOR E-LEARNING IN OTHER COURSES: BY IPAD-SECTION DESIGNATION

	MEANS	
	iPad	Non-iPad
Likelihood to use iPad for other courses	4.44	4.10

A difference in responses by group was found for the question, *Considering face-to-face courses that use iPad technology in the classroom, which of the following best fits your preference?*. There is a statistically significant difference when comparing the proportion of responses of "Classes that make Extensive Use of iPad technology" using a z-score for population proportions at $p \leq .05$ (p = .00889). The proportion of students with a preference for extensive iPad use in classes is significantly greater among the iPad section respondents than among the non-iPad section respondents.

TABLE XVIII. PREFERENCE FOR USE OF IPAD IN COURSES: BY IPAD-SECTION DESIGNATION

	iPad	Non-iPad
Preference for classes that make extensive use of iPad technology	21%	12%

Respondents were asked to provide ratings for the question, *During your FYE course, how would you rate your Professor's comfort level using the iPad as part of the course?*. Assigning values to the verbal rating scale of very comfortable = 5, fairly comfortable = 4, unsure = 3, not very comfortable = 2, not at all comfortable = 1, a significant difference was found using a t-test of means (p = 2.42382E-14). The mean value for iPad section respondents is significantly higher than the non-iPad section respondents.

TABLE XIX. PROFESSOR'S COMFORT LEVEL WITH IPAD: BY IPAD SECTION DESIGNATION

	MEANS	
	iPad	Non-iPad
Professor's comfort level with iPad	3.87	3.00

8.1.9 Free Response Comments

Respondents were asked to provide any additional comments about the iPad use in FYE in a free response section. There were 137 individuals who responded. An analysis of the comments using the text analysis tool, Text iQ, in Qualtrics resulted in the following comment categories.

Nearly half of those who commented indicate that the iPad is useful in FYE for note taking and/or using the Notability application. Other frequent comments are that the iPad is not used much in FYE, MATLAB is limited on the iPad, and that iPads are useful for drawing and/or flowcharts.

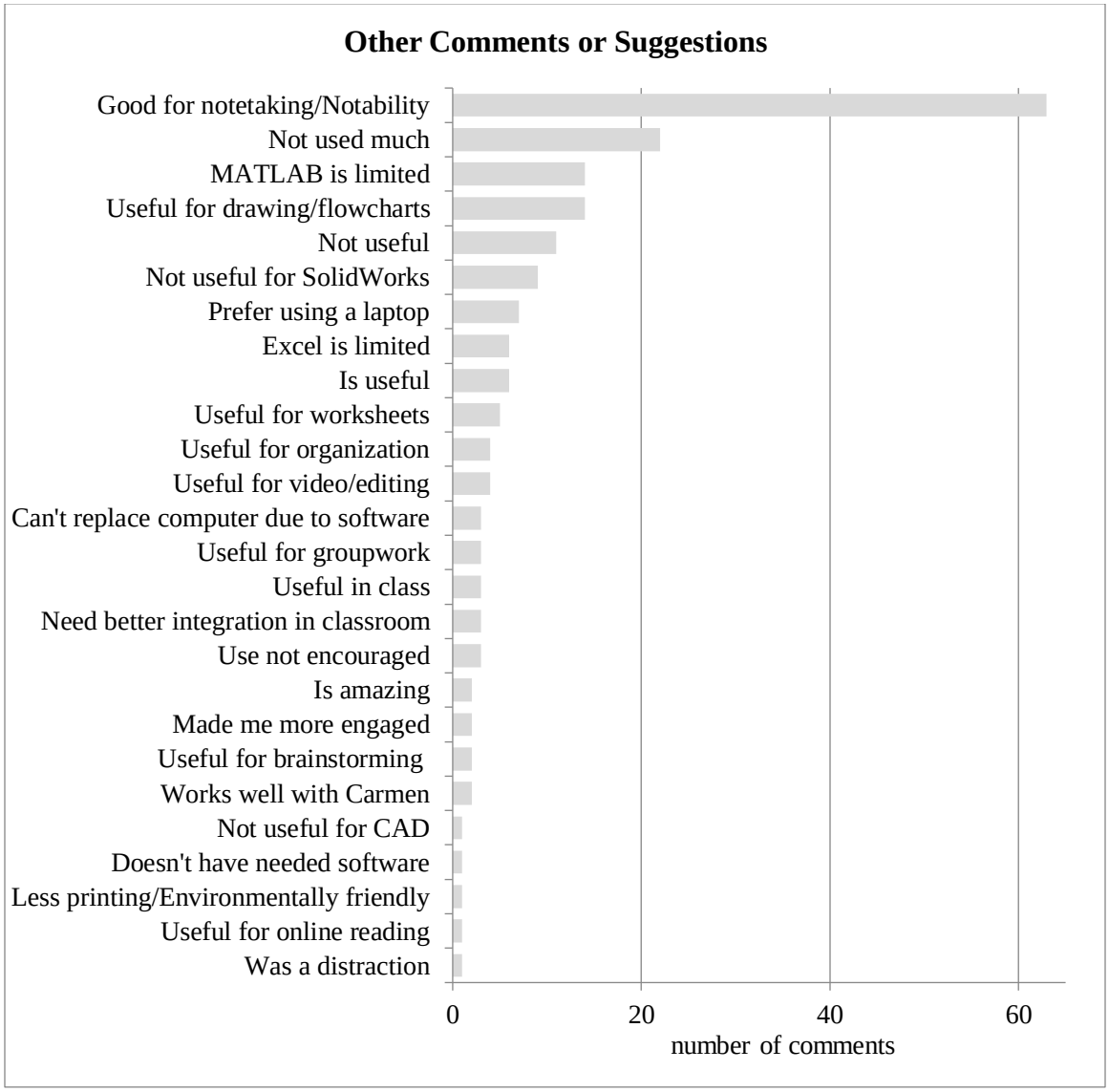

FIGURE 5. STUDENT OPEN-ENDED COMMENT SUMMARY

8.2 Instructor Results

The first five instructor survey questions provided information on if and how the respondent used an iPad for FYE, how often it was used, how it was used, and asked the respondent to rate his or her expertise level. The next two questions collected information on how the instructor directed students to use their iPads, followed by a question on perceptions of the iPad as a teaching tool. The final three scaled response questions collected demographic information and the last survey question was a free response question. Descriptive statistics were performed for each scaled response question. Due to the small sample size, additional statistical analysis was not possible.

8.2.1 Frequency of iPad Use

Only six instructor respondents, all of whom are faculty, indicate they use or have used an iPad in preparation for an FYE course. Among the 49 who responded that they do not or have not used an iPad for FYE, 76% selected the response that they did not receive an iPad, and 20% selected the response that they did not receive the needed training. Of those remaining, 5% indicated it was too much work to include the iPad in FYE, 5% indicated it is not useful for FYE, and 8% responded "Other."

Of the six faculty who did use the iPad *to prepare* for FYE, four indicate they use it "sometimes" and two indicate they use it "about half the time."

Among those same six faculty, four indicate they use the iPad *in class when teaching* FYE "sometimes," one indicated "most of the time," and one indicated "never."

For iPad expertise level, three rate their own level as "good," one chose "excellent," and one chose "average."

8.2.2 Directing Student Use of the iPad

Instructor respondents were asked how often they direct FYE students to use their iPad for Learning, Reflection, and for Collaboration. The following results were obtained from 41 respondents. Definitions (shown below) were provided for clarity.

Learning: e-textbooks, Carmen, notes, drawing
Reflection: whiteboard, reflection exercises
Collaboration: brainstorming, work sharing, AirDrop, BuckeyeBox, Google Drive

TABLE XX. FREQUENCY WITH WHICH INSTRUCTORS DIRECT STUDENTS TO USE IPAD FOR ACTIVITIES

	Nearly every class	Weekly	Once or twice a month	A few times per semester	Never
Learning	12.2%	24.4%	4.9%	14.6%	43.9%
Reflection	0.0%	19.5%	17.1%	14.6%	48.8%
Collaboration	4.9%	12.2%	14.6%	29.3%	39.0%

To obtain a sense of how instructors are providing directions to students, including verbally, written, both, or not at all, a question was asked about directions provided for ten different iPad applications and uses. With the exception of one respondent who indicated written instruction for using flowcharts, no respondents selected "written instruction" for any application or use. For this reason, "written instruction" is not included in the table. Due to the small sample size, the number of responses is shown in the table.

TABLE XXI. HOW DIRECTION IS PROVIDED TO STUDENTS FOR IPAD USE

	How do you provide direction to your FYE students to use their iPads for:			
	Verbally during class	Both verbally and written	I don't provide any direction	Number of responses
e-textbooks	3	3	33	39
BuckeyeBox	9	0	28	37
Notability	12	1	26	39
Carmen	10	5	24	39
Drawing	14	1	23	38
Brainstorming	17	1	21	39
Flowcharts	8	3	26	38
AirDrop	5	0	33	38
Google Drive	7	0	30	37
Explain Everything	1	3	31	35

8.2.3 Perception of the iPad as a Teaching Tool

After removing the "don't know" responses, there were 36 usable responses to Question 9, "How effective do you feel the iPad is as a teaching tool for the following in FYE?" (5 = extremely effective, 4 = very effective, 3 = moderately effective, 2 = slightly effective, 1 = not effective at all). Mean ratings were highest for using iPads for collaboration, followed by teamwork, reflection, and problem solving. The mean value for iPad use in leadership was less than "slightly effective" at 1.97. Overall effectiveness of the iPad as a teaching tool shows a mean value of 2.8, or close to "moderately effective." It should be noted that the majority of those responding are UTA's, who were not provided with university iPads.

TABLE XXII. PERCEPTION OF THE IPAD AS A TEACHING TOOL

USE	MEAN
Collaboration	3.12
Reflection Activities	2.92
Problem Solving	2.79
Teamwork	2.97
Leadership	1.97
Overall effectiveness as a teaching tool	2.80

8.2.4 Free Response Comments

Respondents were asked to provide any additional comments about the iPad use in FYE in a free response section. There were 21 individuals who responded. An analysis of the comments using the text analysis tool, Text iQ, in Qualtrics resulted in the following comment categories.

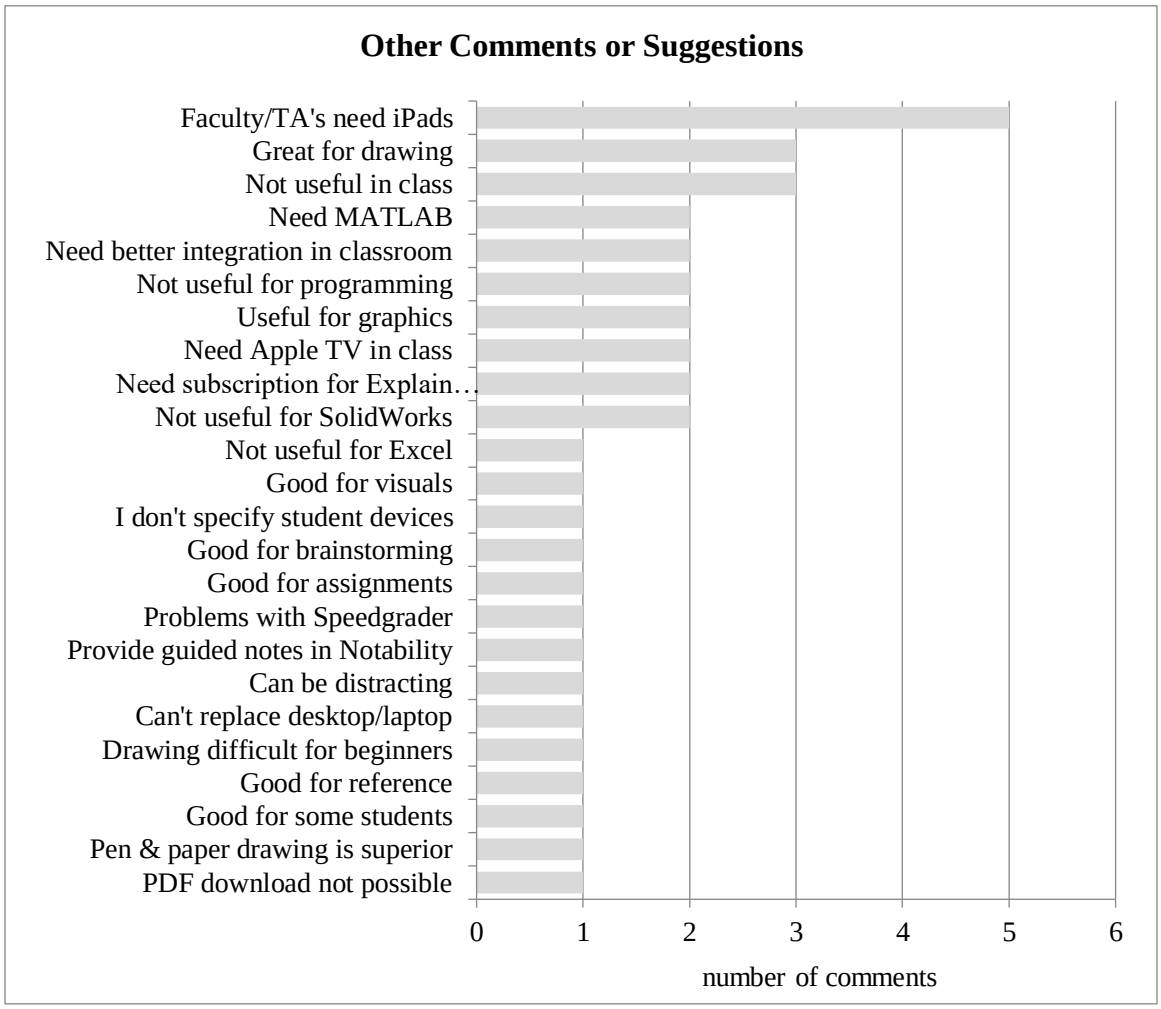

FIGURE 6. INSTRUCTOR OPEN-ENDED COMMENT SUMMARY

9. CONCLUSIONS

The results of this study suggest that students in all FYE courses use their iPads for FYE most frequently outside of class. A large number also use the iPad in the FYE classroom, with the fewest number of students using it for FYE laboratory work. A review of the reported applications and tools shows that the highest frequencies for the use of the iPad are for the course management system and applications for note taking, drawing, and watching videos. These activities are generally associated with learning rather than collaboration or reflection. In fact, students report that they use the iPad the most often for learning activities, followed by collaboration activities, and then the least often for reflection activities. Reported perceived value is moderate to low for the iPad facilitating in-class participation, motivating learning of the course material, and attention to the task, with mean values around 3 on a 5-point scale. The mean values are moderate for facilitating group activities and improving the overall FYE experience.

These results suggest that the iPad is frequently used by students, but they do not yet perceive a high level of value with the iPad in all aspects of FYE. While there appear to be some applications and situations where the majority of students do use the iPad, there also appear to be those where it is not frequently used. Data also show that while the use of the iPad was perceived as only moderate in improving the FYE experience, its use is correlated to a strong preference for using the iPad in other courses, suggesting that students are positive about the use of the iPad in general and do find value in its use for some purposes.

Most interesting is an assessment of the results for students who participated in FYE sections that were designated as "iPad sections." A review of respondents who were part of these iPad designated sections reveal that in comparison to the non-iPad designated respondents, they used the iPad more frequently both in class and in labs for FYE, the majority used the iPad for learning and for collaboration activities at least once per week, and nearly half (48%) used it at least once per week for reflection activities. The perceived value of the iPad in FYE is also significantly higher for iPad section respondents for all five value perception questions, as measured by mean values on the 5-point scale. In addition, 66% agree or strongly agree that the ability to use the iPad improved the FYE experience, as compared to only 47% of those in non-iPad sections.

iPad section respondents also indicate greater likelihood to use the iPad for other courses and a stronger preference for classes that make extensive use of the iPad. Not surprisingly, iPad section respondents also rate their professor's comfort level with the iPad significantly higher than do non-iPad section respondents.

Other sub-category findings of interest are that females indicate more frequent use of the iPad for collaboration activities, a greater likelihood to use the iPad in other courses, and a stronger preference for classes that use the iPad extensively.

Conclusions for the instructor survey are limited due to the small sample size. Some insights gained from these results suggest that UTAs are not providing direction to students about when or how to use the iPad in FYE. The open-ended responses suggest that this may be due in part to the lack of the UTA's having iPads of their own and a lack of training on the iPad and how it could be effectively integrated into FYE. For the instructors who do provide direction to students, verbal direction is more common than written direction on the iPad use. Verbal direction appears to center on the same applications that the student survey identified as being most useful, such as applications for note taking, Canvas, and drawing. For the 36 instructors who rated the effectiveness of the iPad a teaching tool, their perception is that the iPads are

only slightly to moderately effective overall, with the strongest positive perception at just above moderately effective for use in collaboration activities.

Overall, the survey findings suggest that FYE courses that provide greater emphasis on using the iPad would result in greater student use for a wider variety of activities and improved student acceptance of the iPad as a tool that can support the FYE experience. Both the student and instructor results suggest that the iPad is already accepted as a tool in areas where its use is commonly accepted outside of engineering, such as watching videos, taking notes, and drawing or sketching.

In the future, more effectively integrating the iPad in the classroom would support a greater acceptance and use of the iPad for learning, collaboration, and reflection activities in FYE. Effective integration, based on the survey results, would require additional training of FYE instructors, additional applications specific to engineering and FYE, and additional classroom tools that facilitate iPad use in the learning environment.

Faculty training appears to be an important factor for acceptance based on the difference between the iPad and non-iPad course sections and free response feedback. Training would need to be provided not only to the regular faculty but also to teaching assistants. Once all UTA's have their own iPads, instruction on the use of the iPads in FYE should improve.

Both students and instructors identified the need for additional applications that are commonly used in FYE. Suggestions gathered from this survey include iPad versions of MATLAB, SolidWorks, the subscription version of Explain Everything (an interactive whiteboard), and AutoCAD or other CAD software. A more thorough analysis of the necessary software is suggested as a follow up study to ensure that the appropriate software and software versions are identified.

Finally, some comments were collected on the issues with uploading assignments from the iPad to Carmen, issues with viewing assignment in Speedgrader in CANVAS, and the need for Apple TV's in the classroom. An additional study of the technology issues and potential solutions is recommended.

10. FUTURE RESEARCH

Future research is suggested to identify the various software programs and applications needed to effectively support iPad use in FYE. Additional research is suggested to define technology issues with integration of the iPad in FYE. These issues could include hardware, such as Apple TV's, and software integration with course management systems such as Canvas/Carmen, and BuckeyeBox.

The response rates of the instructor survey suggest that future research with this group should implement a different methodology. In-depth interviews might be a better tool for obtaining a larger sample of FYE full-time faculty rather than UTA's. Interview techniques would also capture greater insights, especially from experienced faculty, about the training needed to effectively implement the iPads, as well as how to better instruct students in maximizing the value of the iPad for learning, collaboration, and reflection activities in and outside of class.

In two years, it is expected that the transition to all students having iPads, including future UTA's who are now at the freshmen and sophomore level, will be complete. At that time, a repeat survey of FYE students is suggested to identify if perceptions about the value of iPads have changed. Another area of further study would be to further explore gender differences in FYE and mobile learning.

11. REFERENCES

[1] “Mobile Learning,” Educause. https://library.educause.edu/topics/teaching-and-learning/mobile-learning.

[2] M. Watkins, “University of Kentucky will start giving iPads to incoming freshmen,” Louisville Courier Journal, April 30, 2019.

[3] J. Laster, “Seton Hill to offer iPads to full-time students,” Chronicle of Higher Education, March 30, 2010. https://www.chronicle.com/blogs/wiredcampus/seton-hill-to-offer-ipads-to-full-time-students/22153.

[4] C. Mang, L. Wardley, “Effective adoption of tablets in post-secondary education: recommendations based on a trial of iPads in university classes,” Journal of Information Technology Education: Innovations in Practice. Volume 11, 2012, pp 301-317.

[5] C. Chou, L. Block, R. Jesness, “A case study of mobile learning pilot project in k-12 schools.” Journal of Educational Technology Development & Exchange, 5(2), 2012, pp 11-26.

[6] H. Hu, U. Garimella, “iPads for STEM teachers: A case study on perceived usefulness, perceived proficiency, intention to adopt, and integration in k-12 instruction,” Journal of Educational Technology Development and Exchange, 7(1), 2014, pp 49-66.

[7] L. Nguyen, S. Barton, L. T. Nguyen, “IPads in higher education – hype and hope.” British Journal of Educational Technology, 45(1), 2015, pp 190-203.

[8] T. Diemer, E. Fernandez, J. Streepey, “Student perceptions of classroom engagement and learning using iPads,” Journal of Teaching and Learning with Technology, 1(2), 2013, pp 13-25. 2013.

[9] O. Perez, “A three year longitudinal study of mobile technology and analysis of the impact on STEM-based courses,” 120th ASEE Annual Conference and Exposition, Atlanta, 2013.

[10] Y. Huan, X. Li, M. Aydeniz, T. Wyatt, “Mobile learning adoption: an empirical investigation for engineering education,” International Journal of Engineering Education, 3, 2015, pp 1081-1091.

[11] Y. Huang, "Empirical analysis on factors impacting mobile learning acceptance in higher engineering education," PhD diss., University of Tennessee, 2014.

[12] A. Chamillard, K. Braun, “Evaluating programming ability in an introductory computer science course,” Proceedings of the thirty-first SIGCSE technical symposium on Computer science education, 2000, pp 212-216.

[13] M. Prince, “Does active learning work? A review of the research,” Journal of Engineering Education, 93(3), 2004, pp 223-231.

[14] J. Rossing, W. Miller, A. Cecil, S. Stamper, “iLearning: the future of higher education? Student perceptions on learning with mobile tablets,” Journal of the Scholarship of Teaching and Learning, 12(2), 2012, pp 1-26.

[15] F. Moustaki, C. Kynigos, “Engineering students’ visualization and reasoning processes while interacting with a 3-D digital environment,” Proceedings of PME 35, 3, 2011, pp 257–264.

[16] L. Sepp, M. Orand, J. Turns, L. Thomas, B. Sattler, C. Atman, “On an upward trend: Reflection in engineering education,” ASEE Annual Conference and Exposition, Conference Proceedings, 2015, pp 122.

[17] H. Amer, W. Ibrahim, "Using the iPad as a pedagogical tool to enhance the learning experience for novice programing students," 2014 IEEE Global Engineering Education Conference (EDUCON), Istanbul, 2014, pp 178-183.

[18] J. Ravishankar, J. Epps, F. Ladouceur, R. Eaton and E. Ambikairajah, "Using iPads/tablets as a teaching tool: Strategies for an electrical engineering classroom," 2014 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE), Wellington, 2014, pp 246-251.

[19] G. Kuh, J. Kinzie, J. Buckley, B. Bridges, J. Hayek, “What matters to student success: a review of the literature,” A commissioned report for the national symposium on postsecondary student success: Spearheading a Dialog on Student Success. July 2006.

[20] J. Bansavich, K. Yoshioka, “The iPad: implications for higher education,” Paper presented at the 2011 EDUCAUSE Annual Conference, Philadelphia, PA. October 2011.

[21] “The Ohio State University College of Engineering 2018 Annual Statistical Report,” College of Engineering, 2018, pp 40. https://engineering.osu.edu/about/report.

12. APPENDICES

TIMELINE FROM THESIS PROPOSAL

	AU 18	SP 19	AU 19	SP 20
Literature Review	**x**			
4999H – 3 credits		**x**		
Instructor Survey Development and testing		**x**		
Field Survey		**x**		
Data Analysis of Survey Results		**x**		
Student Survey Development and testing		**x**		
Field Survey		**x**		
Data Analysis of Survey Results		**x**		
4999H – 3 credits			**x**	
Obtain/Analyze end of course survey data			**x**	
Identify areas for further clarification/Gap Analysis			**x**	
Focus Group(s)			**x**	
Write Thesis			**x**	
Oral Defense of Thesis			**x**	
Present at research conference				**x***

***Work in progress results presented during AU19 at the Frontiers in Education Conference

SURVEY INSTRUMENTS

Introduction and purpose

The purpose of this survey is to better understand how the iPad can contribute to positive student attitudes about First Year Engineering (FYE) education in the Autumn FYE course. Your participation in the survey is voluntary.

You may skip questions you would prefer not to answer. All responses provided will be treated as anonymous and will be reported only in aggregate form. No personally identifying information will be stored or connected to your responses. The information from this survey will be used as part of an academic paper.

If you'd like to be entered in the drawing for one of four $25 Amazon gift cards, you will be able to enter your email address at the end of this survey.

Branching question - ipad ownership

Did you receive a university-provided iPad prior to taking your Autumn FYE course?

Yes
No
Don't know/Don't remember

Did you use any iPad, such as one you own, for your Autumn FYE course?

Yes
No

Use of iPad/what used for and how often used

How often would you say you used your iPad **IN CLASS** during your FYE course?

Most of the time
About half the time
Sometimes
Rarely
Never

For what reason(s) did you not use your iPad in class in your FYE course? (Select all that apply)

The iPad does not have the needed applications and/or software for FYE
My instructor did not encourage the use of the iPad
I did not receive any/enough training
I did not see any benefit to using the iPad
I was in a non-iPad section of FYE
Other (specify)

How often would you say you used your iPad DURING LABS for your FYE course?

Most of the time
About half the time
Sometimes
Rarely
Never

How often would you say you used your iPad OUTSIDE of class or labs for your FYE course?

Most of the time
About half the time
Sometimes
Rarely
Never

Perceptions /attitudes: learning, collaboration, reflection, teamwork leadership

How often did you use your iPad for **Learning** activities in FYE? This would include accessing e-textbooks, videos, iPad applications for MATLab, assignments, excel, Carmen, notes, drawing, flowcharts and sketching.

Nearly every day
Once or twice per week
Every couple of weeks
A few times during the semester
Never

How often did you use your iPad for **Reflection** activities in FYE? This would include whiteboard and reflection exercises such as assessing your work, or sharing thoughts about what you've learned on your own or with others.

Nearly every day
Once or twice per week
Every couple of weeks
A few times during the semester
Never

How often did you use your iPad for **Collaboration** activities in FYE? This would include brainstorming, worksharing, AirDrop, Buckeye Box, and Google Drive.

Nearly every day
Once or twice per week
Every couple of weeks
A few times during the semester
Never

Select all of the options below where you used your iPad at least once during the semester for your FYE course.

Quizzes in class	Labs or pre-labs
e-textbooks	Watching videos
Explain Everything	Google Drive
Carmen	BuckeyeBox
Matlab	Making videos
Notability or note taking	AirDrop
Excel	drawing
Worksheets	brainstorming
flowcharts	Other

Student perceptions of Engagement

Indicate your agreement level with the following statements about the iPad in FYE.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I participated more in class when we used the iPad than when we did not use the iPad.	○	○	○	○	○
My attention to the task(s) was greater using the iPad.	○	○	○	○	○
Activities using the iPad motivated me to learn the course material more than activities that did not use the iPad.	○	○	○	○	○
It was easier to work in a group using the iPad than in other group activities.	○	○	○	○	○
The ability to use the iPad for activities improved my experience in FYE.	○	○	○	○	○

Attitudes toward e-learning

After your experience with the iPad in FYE, how likely are you to use it for e-learning in other courses?

Very likely
Somewhat likely
Unsure
Somewhat unlikely
Very unlikely

Considering face-to-face courses that use iPad technology in the classroom, which of the following best fits your preference?

Classes that make little or no use of iPad technology
Classes that use a moderate amount of iPad technology
Classes that make extensive use of iPad technology
No preference

Perception of teacher's use - frequency, expertise/commitment?

During your FYE course, how would you rate your Professor's comfort level using the iPad as part of the course?

Very comfortable
Fairly comfortable
Unsure
Not very comfortable
Not at all comfortable

Demo

Which FYE course did you complete?

FE (iPad Section)
FE (non-iPad Section)
FEH (iPad Section)
FEH (non-iPad Section)
Other (specify)

What is your gender?

Male
Female
Other

What grade did you receive in your first semester FYE course?

A/A-
B+/B/B-
C+/C/C-
D or lower
Prefer not to answer or Don't remember

Have you used your iPad in any other courses during or since FYE?

Yes, whenever I can
Yes, but only when required
No
Other

Block 9

Please provide any additional comments about the iPad use in FYE.

Introduction and purpose

The purpose of this survey is to better understand how the iPad can contribute to positive student attitudes about First Year Engineering (FYE) education. Your participation in the survey is voluntary.
You may skip questions you would prefer not to answer. All responses provided will be treated as anonymous and will be reported only in aggregate form. No personally identifying information will be stored or connected to your responses. The information from this survey will be used as part of an academic paper.

Do you use iPad -Branching block

Do you now or did you in the past use an iPad in preparation for a FYE course? Preparation could include planning for how students will use the iPad in your course or developing activities on the iPad.

- ○ Yes
- ○ No

Block 7

- ○ Sometimes
- ○ Never

How would you rate your expertise level with the iPad?

- ○ Excellent
- ○ Good
- ○ Average
- ○ Poor
- ○ Terrible

iPad Use detail: learning, reflection, collaboration

How often do you direct students in FYE to use their iPad for the following? Use this guideline.
Learning: e-textbooks, Carmen, notes, drawing
Reflection: whiteboard, reflection exercises
Collaboration: brainstorming, worksharing, AirDrop, BuckeyeBox, Google Drive

	Nearly every class	Weekly	Once or twice a month	A few times per semester	Never
Learning	○	○	○	○	○
Reflection	○	○	○	○	○
Collaboration	○	○	○	○	○

Why have you not used an iPad for your FYE course(s)? (Select all that apply)

- ☐ I did not receive the needed training
- ☐ It is too much work for me to incorporate the iPad
- ☐ I don't think it is useful for FYE
- ☐ I did not receive an iPad
- ☐ Other (specify)

How iPad is used in the classroom and comfort level with iPad

How often do you, yourself, use an iPad **as part of preparation for** your first year engineering course(s)?

- ○ Always
- ○ Most of the time
- ○ About half the time
- ○ Sometimes
- ○ Never

About how often do you, yourself, use an iPad **in class** when teaching FYE courses?

- ○ Always
- ○ Most of the time
- ○ About half the time
- ○

How do you provide direction to your FYE students to use their iPads for:

	Verbally during class	Written instructions	Both verbally and written	I don't provide any direction on this	I don't know
Brainstorming	○	○	○	○	○
AirDrop	○	○	○	○	○
Drawing	○	○	○	○	○
BuckeyeBox	○	○	○	○	○
Notability	○	○	○	○	○
Explain Everything	○	○	○	○	○
Google Drive	○	○	○	○	○
e-textbooks	○	○	○	○	○
Carmen	○	○	○	○	○
Flowcharts	○	○	○	○	○

Opinion on value of iPad with regard to problem solving, teamwork, leadership

How effective do you feel the iPad is as a teaching tool for the following in FYE:

	Extremely effective	Very effective	Moderately effective	Slightly effective	Not effective at all	Don't Know
Reflection Activities	○	○	○	○	○	○
Collaboration	○	○	○	○	○	○
Leadership	○	○	○	○	○	○
Problem Solving	○	○	○	○	○	○

	Extremely effective	Very effective	Moderately effective	Slightly effective	Not effective at all	Don't Know
Teamwork	○	○	○	○	○	○
Overall effectiveness as a teaching tool	○	○	○	○	○	○

Demographics (Course#,Sem taught ,#sections, job title?)

In which semesters have you instructed or assisted with at least one section of First Year Engineering? (select all that apply)

- ☐ SP18 or earlier
- ☐ AU18
- ☐ SP19
- ☐ none of these

Which FYE courses have you instructed or assisted with since Autumn 18? (select all that apply)

- ☐ FE
- ☐ FEH
- ☐ Neither of these

What is your current status?

- ○ Tenured Faculty
- ○ Tenure-Track Faculty
- ○ Non Tenure-Track Faculty
- ○ Graduate Teaching Associate
- ○ Undergraduate Teaching Assistant
- ○ Other (specify) _____

Open ended comment section

Do you have any other comments or suggestions about iPad use in First Year Engineering courses?

Powered by Qualtrics